

## AMENDMENTS TO THE SPECIFICATION

*Please add the following section on page 1 immediately following the title and immediately before the section heading "Background of the Invention":*

### Statement of Government Support

This invention was made with United States government support pursuant to grant number AG-10435 from the National Institutes of Health; the United States government has certain rights in the invention.

*Please replace the entire section entitled "Summary of the Invention" with the following rewritten, replacement section. The section to be replaced begins on page 4, line 25 immediately after the end of paragraph [0009] and terminates on page 5, line 18 immediately before the section heading "Detailed Description." The section to be replaced includes a section heading (i.e., "Summary of the Invention") and three unnumbered paragraphs.*

### Summary of the Invention

One embodiment of the invention is a method for transducing a neuron with a heterologous gene, wherein said neuron has a synaptic portion and a cellular portion. This method includes providing a viral vector comprising a heterologous gene to be transduced into a neuron; and contacting the synaptic portion of said neuron with said viral vector under conditions whereby said contacting results in transduction of the viral vector into said synaptic portion, and retrograde movement of said viral vector from the synaptic portion to the cellular portion, wherein said heterologous gene is incorporated into the genome of the neuron. In some method embodiments, said gene is expressed by said neuron for at least two months. In other method embodiments, said gene is expressed by said neuron for at least four months.

Another embodiment of the invention includes a method for increasing proliferation of a nerve cell, wherein said nerve cell has a synaptic portion and a cellular portion. This method includes the steps of providing a viral vector comprising a growth factor gene to be transduced into said nerve cell; contacting the synaptic end of said nerve cell with said viral vector under conditions whereby said contacting results in transduction of the viral vector into said synaptic end, and retrograde movement of said viral vector from the synaptic end to the cellular end of

said nerve cell; and incubating said nerve cell under conditions whereby said growth factor gene is expressed by said nerve cell.

Yet another embodiment of the invention is a method for treating a neurodegenerative disease in a human, that provides the steps of: identifying a human patient in need of treatment for said neurodegenerative disease; providing a viral vector comprising a therapeutic gene to be transduced into a synaptic end of said target neurons of said patient and introducing said viral vector into a terminal field of said target neurons of said patient under conditions whereby said contacting results in transduction of the viral vector into the synaptic end of said target neurons, and wherein said viral vectors migrate from the synaptic end to the cellular end of said target neurons.